

CLAIMS

1. An image pick-up apparatus for picking up an image of object, the image pick-up apparatus comprising:

image pick-up means having a light receiving surface for receiving light from the object to carry out photo-electric conversion, and adapted to output pixel value obtained as the result of the photo-electric conversion;

evaluating means for evaluating the pixel value; and

control means for controlling, in pixel units, exposure time with respect to the light receiving surface on the basis of evaluation result by the evaluating means.

2. The image pick-up apparatus as set forth in claim 1, wherein the evaluating means evaluates whether or not the pixel value is value within a predetermined range; and

wherein when the pixel value is not value within the predetermined range, the control means controls exposure time with respect to pixel of the light receiving surface corresponding to that pixel value so that the pixel value is caused to be value within the predetermined range.

3. The image pick-up apparatus as set forth in claim 2, wherein the control means is operative so that when the pixel value is a predetermined value or more, it shortens exposure time with respect to pixel of the light receiving surface corresponding to that pixel value.

4. The image pick-up apparatus as set forth in claim 2, wherein the control means

is operative so that when the pixel value is less than a predetermined value, it elongates exposure time with respect to pixel of the light receiving surface corresponding to that pixel value.

5. The image pick-up apparatus as set forth in claim 2, wherein the control means comprises:

plural reflection mirrors rotatably provided for reflecting the light onto the light receiving surface; and

a rotational control section for controlling rotations of the respective plural reflection mirrors on the basis of evaluation result by the evaluating means to thereby control exposure time with respect to the light receiving surface in pixel units.

6. The image pick-up apparatus as set forth in claim 2, wherein the control means comprises:

a liquid crystal shutter for transmitting or reflecting the light to allow the light to be incident upon the light receiving surface; and

a liquid crystal control section for controlling, in pixel units, transmission or reflection of light in the liquid crystal shutter on the basis of evaluation result by the evaluating means to thereby control exposure time with respect to the light receiving surface in pixel units.

7. The image pick-up apparatus as set forth in claim 2, wherein the evaluating means comprises:

memory means for storing the pixel value that the image pick-up means outputs;

and

a movement judging section for comparing remarked pixel value to be remarked of the pixel value that the image pick-up means outputs and pixel value corresponding to the remarked pixel value of pixel values stored in the memory means to thereby judge movement of remarked pixel which is pixel corresponding to the remarked pixel value; and

wherein the control means controls exposure time with respect to the remarked pixel of the light receiving surface on the basis of judgment result of movement of the remarked pixel value.

8. The image pick-up apparatus as set forth in claim 1, which further comprises correcting means for correcting the pixel value that the image pick-up means outputs on the basis of exposure time of pixel corresponding to that pixel value.

9. The image pick-up apparatus as set forth in claim 8, which further comprises memory means for storing plural pixel values that the image pick-up means outputs and exposure times of respective pixels corresponding to those plural pixel values,

wherein the correcting means is operative so that when the longest time of the plural exposure times stored in the memory means is assumed to be $1/S_{\text{BASE}}$ and exposure time of pixel value stored in the memory means is assumed to be $1/S$, it multiplies the pixel value stored in the memory means by S/S_{BASE} to thereby correct the pixel value.

10. The image pick-up apparatus as set forth in claim 8, which further comprises

a display control section for displaying picture image on a display section for displaying picture image in accordance with pixel value corrected at the correcting means.

11. The image pick-up apparatus as set forth in claim 1, which further comprises a display control section for displaying picture image on a display section for displaying picture image in accordance with pixel value that the image pick-up means outputs and exposure time of pixel corresponding to that pixel value.

12. The image pick-up apparatus as set forth in claim 11, wherein the display control section comprises:

memory means for storing plural pixel values that the image pick-up means outputs and exposure times of pixels corresponding to the respective pixel values;

a correcting section for correcting respective plural pixel values stored in the memory means by exposure times corresponding thereto; and

a normalizing section for normalizing the corrected pixel value in accordance with display accuracy of the display section.

13. The image pick-up apparatus as set forth in claim 1, which further comprises memory means for storing plural pixel values that the image pick-up means outputs and exposure times of pixels corresponding to the respective pixel values in such a manner to correspond to each other.

14. An image pick-up method of picking up image of object, the image pick-up method comprising:

an evaluation step of evaluating pixel value acquired from an image pick-up section having a light receiving surface for receiving light from the object to carry out photo-electric conversion and adapted to output the pixel value obtained as the result of the photo-electric conversion; and

a control step of controlling, in pixel units, exposure time with respect to the light receiving surface on the basis of evaluation result by the evaluation step.

15. A program for allowing computer to carry out image pick-up processing for picking up image of object, the program including:

an evaluation step of evaluating pixel value acquired from an image pick-up section having a light receiving surface for receiving light from the object to carry out photo-electric conversion and adapted to output the pixel value obtained as the result of the photo-electric conversion; and

a control step of controlling, in pixel units, exposure time with respect to the light receiving surface on the basis of evaluation result by the evaluation step.

16. A program recording medium adapted so that program for allowing computer to carry out image pick-up processing which picks up image of object is recorded, wherein there is recorded program comprising:

an evaluation step of evaluating pixel value acquired from an image pick-up section having a light receiving surface for receiving light from the object and adapted to output pixel value obtained as the result of the photo-electric conversion; and

a control step of controlling, in pixel units, exposure time with respect to the

light receiving surface on the basis of evaluation result by the evaluation step.

17. A data structure of data which can be read by computer, wherein plural pixel values that an image pick-up unit for picking up image of object outputs and exposure times every respective pixel values used in the image pick-up unit in order to obtain respective ones of the plural pixel values are caused to correspond to each other.

18. A data recording medium adapted so that data which can be read by computer is recorded, wherein plural pixel values that an image pick-up unit for picking up image of object outputs and exposure times every respective pixels used in the image pick-up unit in order to obtain respective ones of the plural pixel values are recorded in such a manner that they are caused to correspond to each other.

19. An image pick-up control apparatus for controlling an image pick-up section having a light receiving surface for receiving light from object and adapted to output pixel value obtained as the result of the photo-electric conversion, the image pick-up control apparatus comprising:

an evaluating section for evaluating the pixel value; and

control means for outputting, to the image pick-up section, a control signal for controlling, in a predetermined surface unit, exposure time with respect to the light receiving surface on the basis of evaluation result by the evaluating section.

20. An image pick-up apparatus for picking up image of object, the image pick-up apparatus comprising:

image pick-up means having a light receiving surface for receiving light from

the object to carry out photo-electric conversion and adapted to output pixel value obtained as the result of the photo-electric conversion;

control means for controlling plural exposure times with respect to the light receiving surface; and

selector means for selecting one pixel value from pixel values corresponding to respective ones of the plural exposure times of respective pixel positions which are obtained by picking up image of the object by the plural exposure times on the basis of control of the control means in the image pick-up means.

21. The image pick-up apparatus as set forth in claim 20, wherein the selector means selects one pixel value closest to a predetermined value from pixel values corresponding to respective ones of the plural exposure times.

22. The image pick-up apparatus as set forth in claim 20, which further comprises evaluating means for evaluating at least one pixel value of pixel values corresponding to respective ones of the plural exposure times,

wherein the control means changes at least one of the plural exposure times on the basis of evaluation result by the evaluating means.

23. The image pick-up apparatus as set forth in claim 22, wherein the evaluating means evaluates whether or not at least one pixel value of pixel values corresponding to the plural exposure times is value within a predetermined range; and

wherein the selector means selects pixel value corresponding to exposure time except for exposure time corresponding to the at least one pixel value of the plural

a liquid crystal control section for controlling, in units of the light receiving surface, transmission or reflection of light in the liquid crystal shutter on the basis of evaluation result by the evaluating means to thereby control exposure time with respect to the light receiving surface.

28. The image pick-up apparatus as set forth in claim 20, which further comprises correcting means for correcting the pixel values of respective pixel positions that the image pick-up means outputs on the basis of exposure times corresponding to those pixel values.

29. The image pick-up apparatus as set forth in claim 28, which further comprises memory means for storing pixel value selected at the selector means.

30. The image pick-up apparatus as set forth in claim 29, wherein the evaluating means comprises a movement judging section for comparing remarked pixel value to be remarked of pixel values that the image pick-up means outputs and pixel value corresponding to the remarked pixel value of pixel values stored in the memory means to thereby judge movement of remarked pixel which is pixel with respect to the remarked pixel value; and

wherein the control means controls the exposure time on the basis of judgment result of movement of the remarked pixel.

31. The image pick-up apparatus as set forth in claim 29, wherein the memory means stores pixel values of respective pixel positions selected at the selector means, and stores exposure times of those pixel values.

32. The image pick-up apparatus as set forth in claim 31, wherein the correcting means is operative so that when the longest exposure time of plural exposure times stored in the memory means is assumed to be $1/S_{\text{BASE}}$ and exposure time of pixel value stored in the memory means is assumed to be $1/S$, it multiplies pixel value stored in the memory means by S/S_{BASE} to thereby correct the pixel value.

33. The image pick-up apparatus as set forth in claim 29, which further comprises a display control section for displaying picture image on a display section for displaying picture image in accordance with pixel value corrected at the correcting means.

34. The image pick-up apparatus as set forth in claim 20, which further comprises a display control section for displaying picture image on a display section for displaying picture image in accordance with pixel value selected at the selector means and exposure time corresponding to that pixel value.

35. The image pick-up apparatus as set forth in claim 34, wherein the display control section comprises:

a correcting section for correcting respective ones of plural pixel values stored in the memory means by exposure times corresponding thereto; and

a normalizing section for normalizing the corrected pixel value in accordance with display accuracy of the display section.

36. An image pick-up method of picking up image of object, the image pick-up method comprises:

a control step of controlling plural exposure times with respect to a light receiving surface at an image pick-up section having a light receiving surface for receiving light from the object to carry out photo-electric conversion and adapted to output pixel value obtained as the result of the photo-electric conversion; and

a selection step of selecting one pixel value from pixel values corresponding to respective ones of the plural exposure times of respective pixel positions which are obtained by picking up image of the object by the plural exposure times on the basis of control at the control step in the image pick-up section.

37. A program for allowing computer to carry out image pick-up processing for picking up image of object, the program comprising:

an evaluation step of evaluating pixel values corresponding to respective ones of the plural exposure times of respective pixel positions which are obtained by controlling plural exposure times with respect to a light receiving surface in an image pick-up section having the light receiving surface for receiving light from the object to carry out photo-electric conversion and adapted to output pixel value obtained as the result of the photo-electric conversion; and

a selection step of selecting one pixel value from pixel values corresponding to respective ones of the plural exposure times on the basis of evaluation result by the evaluation step.

38. A program recording medium adapted so that program for allowing computer to carry out image pick-up processing for picking up image of object is recorded,

wherein there is recorded program comprising:

an evaluation step of evaluating pixel values corresponding to respective ones of the plural exposure times of respective pixel positions which are obtained by controlling plural exposure times with respect to a light receiving surface in an image pick-up section having the light receiving surface for receiving light from the object to carry out photo-electric conversion and adapted to output pixel value obtained as the result of the photo-electric conversion; and

a selection step of selecting one pixel value from pixel values corresponding to respective ones of the plural exposure times on the basis of evaluation result by the evaluation step.